

NGDA Dataset Report

Official NGDA Title: Moderate Resolution Imaging Spectroradiometer (MODIS) - Aqua

Metadata Record Title: Moderate Resolution Imaging Spectroradiometer (MODIS) - Aqua

A-16 NGDA Theme: Imagery

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Metadata:

Registration Status: Complete

Registered on 7/9/2015

GeoPlatform Link*: <https://www.geoplatform.gov/node/243/d1153230-6a2c-4781-a663-808260ab7281>

Data.gov Metadata Link*: <http://catalog.data.gov/harvest/object/4940201a-2469-4ca5-a729-9495f7b08fed/html>

*If the metadata has been updated and reharvested after publication of this report, the link may no longer be valid. The dataset may be searched for manually in Data.gov or GeoPlatform.gov.

NGDA Lifecycle Maturity Assessment (LMA) Report

Time Frame:

Baseline assessment responses include dataset activities from 2002 to 2015.

LMA Submission:

Status: Complete

Date: 10/29/2015

Extension Requested: No

LMA Reviewer(s):

Supervisor: Andrew Mitchell, andrew.e.mitchell@nasa.gov

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Attachments:

To get access to any attachments referenced in the report, email the LMA Help Desk at NGDA_LMA_help@fgdc.gov. Please use the subject "Dataset Report Attachment(s)" and indicate the associated official NGDA title.

*Senior Agency Official for Geospatial Information (SAOGI)

Lifecycle Maturity Assessment (LMA) Summary

Overall Maturity:

Optimized; Established

General Questions: 100%

Optimized; Established

Stage 1 - Define/Plan: 100%

Optimized; Established

Stage 2 - Inventory/Evaluate: 100%

Optimized; Established

Stage 3 - Obtain: 100%

Optimized; Established

Stage 4 - Access: 100%

Optimized; Established

Stage 5 - Maintain: 100%

Optimized; Established

Stage 6 - Use/Evaluate: 100%

Optimized; Established

Stage 7 - Archive: 66%

Managed; Predictable

NGDA Dataset Maturity Definitions:

How To Calculate Maturity: https://www.geoplatform.gov/sites/default/files/How_to_Calculate_Maturity.pdf

Maturity	Maturity Characteristics for All Lifecycle Stages
Optimized; Established Rank = 5	Dataset meets virtually all business needs of all users. The dataset is considered authoritative by owners and secondary users. It is curated across all stages of the approved lifecycle. Future needs are defined on a regular basis and resources for addressing both current and future business requirements are available.
Mature; Consistent Rank = 4	Dataset meets all the business needs of the primary owner and most of the secondary users. The dataset is curated and used as authoritative by the primary owner. Dataset is used widely by secondary users actively engaged in sustaining the dataset. Future needs are identified and steps are planned to address these. All stages are supported and reviewed on a recurring basis. The dataset is well managed in relation to the approved lifecycle.
Managed; Predictable Rank = 3	Dataset meets a significant number of the business needs of the primary owner and is widely used as an authoritative resource by secondary users. Benchmark activities are occurring in at least four of the approved lifecycle stages. Management practices in relation to the approved lifecycle is moderate but consistent. Dataset is integrating changing business requirements in lifecycle stages impacting overall maturity.
Transition; Transformation Rank = 2	Dataset meets business needs of the primary owner and has moderate use by secondary users. Benchmark activities are occurring in at least three stages. Efforts to integrate funding, include partners, and obtain data are not supported in a sustained manner. Management practices in relation to the stages of the approved lifecycle is limited.
Planned; Initial Development Rank = 1	Dataset limited in meeting business needs of the primary owner. Benchmark activities in the approved lifecycle are just starting to consider secondary uses, partnerships are forming to support additional dataset uses. Dataset development is in a very early stage. Minimal or limited management against the benchmarks in the approved lifecycle.
No Activity Rank = no activity	Dataset meets project or local business needs of the primary owner, secondary or additional uses or users were not considered, not recognized as an authoritative data or is part of a similar dataset. Not managed to any of the benchmarks in the approved lifecycle.

General Questions for All Stages

1) Is there a recurring process to obtain funding for all lifecycle stages of this dataset?

Answer: Funding support is part of agency budget on a recurring basis, funding is consistent and tied to business processes, and supports all lifecycle stages.

Justification Comment:

Attachment(s): 0

The NASA datasets (ASTER and MODIS) are supported through all lifecycle stages with funding support which is a part of the agency budget. When the Earth Observing System Program was initiated in 1990, and resized through a series of community reviews during early to mid-1990's, the NASA budget needed to cover all lifecycle stages was estimated and became a part of the overall NASA budget. NASA's Planning, Programming, Budgeting, and Execution (PPBE) process revisits the budget requirements each year, and as long as the instruments are in operation and are collecting data, the budget includes funds needed to maintain and operate the instruments, collect data from them, and process and archive the resulting datasets. NASA's Earth Science budget, through its multi-mission operations (MMO) line, funds the Earth System Data and Information System (ESDIS) Project responsible for processing and archiving the data from ASTER and MODIS. The ESDIS Project ensures that the data are available to users through its Distributed Active Archive Centers (DAACs) as long as there is active community interest to use the data. NASA's mandate does not include permanent archival of Earth science data. However, the ESDIS Project ensures that the datasets and associated metadata and documentation are gathered for permanent archival. The ASTER datasets and MODIS land datasets will be transferred to the US Geological Survey (USGS) for permanent archival.

2) Is there a process in place to ensure that open government and transparency guidelines are followed in all lifecycle stages for this dataset?

Answer: Process is published as appropriate with respect to sensitivity requirements, process is transparent, published appropriately.

Justification Comment:

Attachment(s): 0

The data from the ASTER and MODIS instruments on-board NASA spacecraft are being acquired, processed and archived since their launch in 1999. The end-to-end lifecycle processes are governed by NASA Procedural Requirements (NPR) 7120.5E (see <http://nodis3.gsfc.nasa.gov/displayDir.cfm?t=NPR&c=7120&s=5E>). The data are available to all users openly and freely according the NASA's Earth Science Data and Information Policy (<http://science.nasa.gov/earth-science/earth-science-data/data-information-policy/>).

3) Are there processes and tools in place so that staff are sufficiently knowledgeable to ensure a continuity of the dataset for all stages of the lifecycle, especially during staffing transitions?

Answer: Processes and tools to ensure dataset continuity are in place and implemented for all lifecycle stages.

Justification Comment:

Attachment(s): 0

The ASTER and MODIS instruments on the Terra spacecraft have been in operation since December 1999, and the MODIS instrument on the Aqua spacecraft has been operating since May 2002, and all the operational procedures have matured over many years. The ASTER and MODIS instrument team members who are intimately familiar with the instruments' characteristics and the science to be derived from them are responsible for defining, developing and processing the standard products that constitute the ASTER and MODIS datasets. For each of the datasets, the responsible scientists have developed Algorithm Theoretical Basis Documents (ATBDs) which have gone through a rigorous peer review process in the scientific community, led by NASA's Earth Observing System (EOS) Senior Project Scientist. Production of the datasets (various levels of digital products derived from the instrument measurements) will continue as long as the instruments continue to function. The datasets

are assigned to NASA's Earth Observing System Data and Information System (EOSDIS) Distributed Active Archive Centers (DAACs), each of which is collocated with experts in respective scientific disciplines. Each of the DAACs is staffed with user services personnel who acquire knowledge of the datasets sufficient to answer questions from users, consulting scientific experts as necessary. Product documentation and answers to Frequently Asked Questions (FAQs) are provided on the DAAC web pages. Examples of these can be found at

https://lpdaac.usgs.gov/dataset_discovery/aster/aster_products_table/ast_l1t and

<https://lpdaac.usgs.gov/faq-page>. NASA has developed an Earth Science Data Preservation Content Specification (see <https://earthdata.nasa.gov/standards/preservation-content-spec>) to ensure that the data, metadata and documentation sufficient to ensure understandability of the data are gathered and preserved so that the datasets remain understandable and usable in the permanent archive phase as well.

STAGE 1 - Define/Plan

4) Are user and business requirements defined and formalized?

Answer: A recurring process is in place, including defining new partner and stakeholder business needs as they arise, and is fully implemented.

Justification Comment:

Attachment(s): 0

The datasets derived from the ASTER and MODIS instruments have been in production since the launch of the EOS Terra satellite in 1999. The requirements for the "standard products" from those instruments were established in the mid-1990's through a scientific review process. The scientific quality assurance, calibration and validation are all part of the instrument science program managed by NASA. The data system requirements to process, reprocess (as required), archive and distribute the datasets were also established as a part of mission definition and planning. One of the key requirements on the data system was to accommodate growth and evolution. An example of growth is to be able to reprocess data from the beginning of the mission to the present date (many years) within a few months. The user community is diverse, large and global. There are two key processes to assess the user community needs and make improvements in the data system to serve the ASTER and MODIS users. The first is a set of User Working Groups (UWG) at each of the Distributed Active Archive Centers (DAACs), which periodically review the DAAC data holdings and services offered and make recommendations for improvement. The second is an annual user survey to derive the "American Consumer Satisfaction Index (ACSI)", which also asks users to provide free-form comments on desired improvements. Both these processes have been in place for over a decade.

5) How are partners/stakeholders involved in the requirements collection process?

Answer: A recurring process is in place, including defining new partner and stakeholder business needs as they arise, and is fully implemented.

Justification Comment:

Attachment(s): 0

The key stakeholders are NASA Headquarters (funding organization), the ESDIS Project (responsible for implementation and management), DAACs (stewards of datasets) and user community (users of datasets). Processes are in place for engaging all of these stakeholders. The PPBE process that funds the ESDIS Project and revisits budget requirement annually as well as weekly and monthly reporting by the ESDIS Project keeps NASA HQ involved. The annual work plans, ESDIS-DAAC weekly teleconferences and one or two meetings each year keeps the DAACs involved in the process. User Working Groups and annual user surveys provide user inputs to requirements.

6) Is there a quality assurance process for the dataset?

Answer: Quality assurance published as appropriate with respect sensitivity requirements.

Justification Comment:

Attachment(s): 0

NASA follows the information quality guidelines published at

http://www.nasa.gov/pdf/517756main_FINAL_NASA_guidelines.pdf. In addition, in managing the scientific digital data products such as the ASTER and MODIS datasets, NASA ensures that the data are well-calibrated, validated and documented so that users are aware of the data quality prior to using the data. The data are released promptly according the Earth Science Data and Information Policy (<http://science.nasa.gov/earth-science/earth-science-data/data-information-policy/>), but with clear indication of the maturity levels (<http://science.nasa.gov/earth-science/earth-science-data/data-maturity-levels/>) so that the users become aware of the merits and limitations of the datasets before using them.

7) Is there a process to evaluate the sensitivity, privacy, and confidentiality of this dataset?

Answer: Sensitivity, privacy, and confidentiality evaluations fully implemented, reviewed and updated on a recurring basis.

Justification Comment:

Attachment(s): 0

Given the free and open nature of the datasets and NASA's Earth Science Data and Information Policy (<http://science.nasa.gov/earth-science/earth-science-data/data-information-policy/>) there are no sensitive, private or confidential aspects to these datasets. These are scientific digital products derived from spaceborne observations and are shared freely, on a non-discriminatory basis, with the community for the advancement of science and public good. However, since ASTER is a Japanese instrument flying on a NASA spacecraft, NASA operates under a Memorandum of Understanding with Japan and ensures that the terms of the memorandum are honored.

8) Are defined data standards used in collecting, processing, and/or rendering the data?

Answer: Standards fully implemented documented and published as appropriate.

Justification Comment:

Attachment(s): 0

The requirements (such as accuracy, timeliness, collection methods) pertaining to collection of science data from ASTER and MODIS on board the NASA satellites are well documented. For example, see <http://modis.gsfc.nasa.gov/about/specifications.php> and http://asterweb.jpl.nasa.gov/content/03_data/04_Documents/aster_user_guide_v2.pdf. The data formats and metadata used for the digital products derived from the instrument observations follow community standards approved by NASA Headquarters (see <https://earthdata.nasa.gov/user-resources/standards-and-references#ed-standards>).

STAGE 2 - Inventory/Evaluate

9) Is there a process for determining if data necessary to meet requirements already exist from other sources (either within or outside the agency) before collecting or acquiring new data?

Answer: Process for determining appropriate data is being reused fully implemented, reviewed, and updated on a regular basis.

Justification Comment:

Attachment(s): 0

This question does not really apply to datasets from ASTER and MODIS instruments on board NASA satellites more than 10 years old. When the Earth Observing System (EOS) Program was approved in 1990 and instrument complements were selected for flight on the EOS spacecraft a significant number of community based reviews and restructuring, rescoping, rebaselining, and reshaping occurred with a thorough analysis of scientific requirements and which instrument complement could best meet the requirements, considering international collaborations where needed and appropriate. As long as the instruments continue to operate the datasets will continue to be produced, archived and distributed to users. While the instruments and spacecraft get older and approach their end of life, one needs to plan for replacements to meet the scientific requirements for long-term time series. NASA has worked in collaboration with NOAA on the Suomi National Polar Partnership (SNPP) spacecraft on which the instrument VIIRS is taking measurements similar to those from MODIS.

STAGE 3 - Obtain

10) Is there a process for obtaining data in relation to this dataset?

Answer: Process is fully implemented, reviewed and updated on a regular basis.

Justification Comment:

Attachment(s): 0

The ASTER and MODIS datasets consist of the measurements from the ASTER and MODIS instruments on NASA's EOS spacecraft, as well as standard digital scientific products derived from those measurements. The data collection began in 1999 from the EOS Terra spacecraft which carries ASTER and one of two MODIS instruments, and in 2002 from the EOS Aqua spacecraft which carries the other MODIS instrument. Thus the data collection process has been in place for more than a decade, and will continue as long as the instruments and spacecraft are functioning. Once every two years, NASA Headquarters conducts a "Senior Review", a review by an external scientific committee, of all missions that have exceeded their original design life and uses the results of the review to decide whether to extend the collection of data or terminate the missions.

11) Is the metadata in a FGDC endorsed geospatial metadata standard?

Answer: Metadata is available in a format endorsed by the FGDC, it fully describes the dataset and provides all the information required to make the dataset discoverable, accessible, and usable.

Justification Comment:

Attachment(s): 0

Metadata are compatible with FGDC content standard and its extension to remote sensing data (FGDC Document Number FGDC-STD-012-2002). Metadata are also easily mapped to ISO 19115-1 and have Project Open Data compliant translations as documented here: <https://project-open-data.cio.gov/metadata-resources/>.

12) How complete is the geographic coverage as defined in the requirements for the dataset?

Part 1 Answer: Business requirements for cyclic updates identified and a process is in place.

Part 2 Answer: Dataset has presently attained the greatest geographic coverage as defined by the current requirements or roughly 100%.

Justification Comment:

Attachment(s): 0

The MODIS instruments on the EOS Terra and Aqua satellites acquire measurements continuously. Each instrument's observations cover the entire Earth in two days. The pixel sizes in MODIS data are 250 m, 500 m and 1000 m depending on the spectral band. It has 36 spectral bands. (see <http://modis.gsfc.nasa.gov/about/specifications.php>).

STAGE 4 - Access

13) Do you have a process for providing users access to the data in an open digital machine readable format?

Answer: User access process is fully implemented, data is available, process is reviewed and updated on a recurring basis.

Justification Comment:

Attachment(s): 0

The ASTER and MODIS datasets have been accessible to all users freely and openly according to NASA's Earth Science Data and Information Policy (<http://science.nasa.gov/earth-science/earth-science-data/data-information-policy/>) since the beginning of data acquisition from these instruments. The data are "born digital" and are retained in digital format. All the data are available on line and are searchable, accessible and downloadable. Community-accepted standard formats are used. A list of NASA HQ approved standard formats is shown at <https://earthdata.nasa.gov/user-resources/standards-and-references>. Format conversion services are also available to provide data in formats requested by users.

STAGE 5 - Maintain

14) Is there a maintenance process for updating and storing the dataset?

Answer: Dataset maintenance process is fully implemented and processes are reviewed and periodically updated.

Justification Comment:

Attachment(s): 0

The ASTER and MODIS datasets are maintained in the EOSDIS Distributed Active Archive Centers (DAACs). ASTER data products are generated at the Land Processes DAAC (LP DAAC) at the USGS EROS Center in Sioux Falls, SD using software provided by the ASTER science team at NASA's Jet Propulsion Laboratory. MODIS data products are generated at the Goddard Space Flight Center (GSFC) – the Oceans products are generated by the Ocean Biology Processing Group and archived at the Ocean Biology DAAC (OB.DAAC at GSFC) and the Physical Oceanography DAAC (PO.DAAC) at NASA's Jet Propulsion Laboratory (JPL). The remaining MODIS data products are generated by the MODIS Adaptive Processing System and archived at the Level 1 and Atmosphere Archive and Distribution System (LAADS at GSFC), LP DAAC, and the National Snow and Ice Data Center (NSIDC) DAAC (at University of Colorado, Boulder), depending on the type of products. Interface control documents and operations agreements have been in place since the early days of the EOS Terra and Aqua missions between the DAACs and the science teams for delivery of software and/or standard data products to the DAACs. These ensure that the data flows are maintained to keep up with the acquisition of data from the instruments, updates are made to software and data are reprocessed as required. The DAACs have processes to ensure that datasets are backed up to minimize risk of data loss, and to ensure that data are migrated to newer media as technology changes over time.

15) Is there an error correction process as part of dataset maintenance?

Answer: Error correction process includes user notification, process reviewed on a recurring basis.

Justification Comment:

Attachment(s): 0

Any scientific data products generated using the data from NASA's remote sensing instruments receive continuous scrutiny by the data producing science teams and, through exposure and use, by a broad scientific community. Any errors discovered are documented and periodically the data are reprocessed starting from the beginning of the mission to the present time. Reprocessing campaigns are scheduled and announced to the user community. The reasons for reprocessing and generation of each new version are well documented. During the course of a mission several reprocessing campaigns can occur. For example, MODIS is currently generating its sixth version of products (called Collection 6). For example, see http://modis-atmos.gsfc.nasa.gov/products_C006update.html.

STAGE 6 - Use/Evaluate

16) Is there a process to determine if the dataset meets user needs?

Answer: Process is fully implemented and repeated on a recurring basis.

Justification Comment:

Attachment(s): 0

There is an on-going process for evaluation and feedback by users. Users can provide feedback any time to the respective DAACs' user services staff. Regular (at least annual) meetings of the DAAC User Working Groups is another mechanism for the DAACs to receive feedback from users to indicate whether the digital data products offered meet their needs. Also, an independent, annual survey of the DAAC user community provides inputs on the data and services.

17) Is there a process to provide users information on how to access and properly use the dataset?

Answer: Process is fully implemented supporting access and proper use, process is reviewed on a recurring basis.

Justification Comment:

Attachment(s): 0

NASA provides several mechanisms to access its Earth science datasets to make it convenient for various types of users who may be familiar with the Earth Observing System Data and Information System (EOSDIS) and its Distributed Active Archive Centers (DAACs) in varying degrees. For example, the search window on <https://earthdata.nasa.gov/> permits a user to search and access data of interest without knowing ahead of time which DAACs hold the data. The Land Processes DAAC (LP DAAC) provides information about and access to ASTER data products (https://lpdaac.usgs.gov/dataset_discovery/aster) as well as MODIS land data products (https://lpdaac.usgs.gov/dataset_discovery/modis). Other DAACs that hold MODIS data products similarly provide descriptions and mechanisms to access the products (see <https://ladsweb.nascom.nasa.gov/data/>, http://nsidc.org/data/modis/data_summaries/, <http://oceancolor.gsfc.nasa.gov/cms/data/terra>, and <http://podaac.jpl.nasa.gov/MODIS>). The DAACs provide various tools for functions such as searching and subsetting data (see <https://earthdata.nasa.gov/earth-observation-data/tools>). The Earth Science Data and Information System (ESDIS) Project conducts a series of webinars on topics related to access and use of the datasets offered by the DAACs (see <https://earthdata.nasa.gov/user-resources/webinars-and-tutorials>). Several “Data recipes” are available (<https://earthdata.nasa.gov/user-resources/data-recipes>) to show users how to obtain, process, analyze and interpret the datasets. The mechanisms to assist users are reviewed on an on-going basis and as new technologies/techniques become available they are incorporated in the system. Instructions are provided on how to cite and acknowledge data and services (see <https://earthdata.nasa.gov/earth-observation-data/data-citations-acknowledgements>).

18) Are the business processes and management practices assessed to meet changing technology?

Answer: Assessment process is fully implemented for taking advantage of changing technology, process is reviewed on a recurring basis.

Justification Comment:

Attachment(s): 0

NASA has established robust mechanisms for assessing whether the datasets it offers (including ASTER and MODIS) are meeting the users’ needs. The EOSDIS Metrics System gathers various types of usage metrics that provides a measure of how much global demand is for the datasets. The biennial Senior Reviews include an assessment of the science resulting from the datasets as well as endorsement of applications of datasets by operational agencies. On an on-going basis, the DAAC User Working Groups assess the utility of data and services offered by the DAACs and suggest improvements and priorities for services on various datasets. Annual user surveys (American Consumer Satisfaction Index - ACSI - surveys) provide additional insights into the utility of data and services. NASA’s Earth Science Data System Working Groups assess various aspects of the data systems to ensure that the systems keep current in technologies and maximize the utility of the datasets.

STAGE 7 - Archive

19) Is there an archiving process for the dataset?

Answer: Archival and/or processes are in early implementation.

Justification Comment:

Attachment(s): 0

NASA is not legislatively mandated to preserve data permanently as other agencies such as the USGS, NOAA and NARA are, it is essential for NASA to preserve all the data and associated content beyond the lives of NASA’s missions to meet NASA’s near-term objective of providing access to data and services for active scientific research. Also NASA has to ensure that the data and associated content are preserved for transition to permanent archival agencies. NASA is well positioned to meet its requirements to archive the data for active scientific research and to preserve data and associated content for transition for permanent archival. NASA has developed an Earth Science Preservation Content Specification document (see <https://earthdata.nasa.gov/standards/preservation-content-spec>) which is being applied as a requirement for new missions and a checklist to gather all relevant content

from its currently operating and older missions. The ASTER and MODIS land products will be transitioned to the USGS for permanent archival.